Weather Note

AN ANOMALOUS SNOW AT OAK RIDGE, TENNESSEE

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At 0800 EST on December 22, 1960, the Weather Bureau Research Station at Oak Ridge, Tenn., received reports of an isolated snowfall downwind of the massive cooling towers of the Oak Ridge Gaseous Diffusion Plant (K–25), 10 miles southwest of Oak Ridge. (See fig. 1.) This was the first known report of snow being directly connected with any of the three gaseous diffusion plants operating in this country (the others are at Paducah, Ky., and Portsmouth, Ohio). A gaseous diffusion plant separates the lighter element uranium-235 from heavier uranium-238 by boiling uranium hexafluoride through endless cycles. The cooling requirements for the plant at Oak Ridge consume 20 million gallons of water per day, most of which escapes as water vapor. (See figs. 2 and 3.) Aside from a semipermanent cumulus cloud over the plant site, no direct effect of this additional moisture (temperature, dewpoint, rainfall) has heretofore been reported. Accordingly, Weather Bureau personnel and an Atomic Energy Commission photographer investigated the area and found the following items of interest.

The snow was intermittent and fairly light. Downwind from the cooling towers, snow began falling about 3 miles distant and continued to be deposited noticeably on the ground up to 5 miles. Some very light snow was reported as far as 10 miles from the towers later in the morning, but by noon all activity seemed to have ceased. The snow that was deposited 3 to 5 miles from the cooling towers was normal in appearance with some flakes up to ¼-inch in size. The snow falling farther downwind was finer in structure and, in the sun, appeared almost crystal-

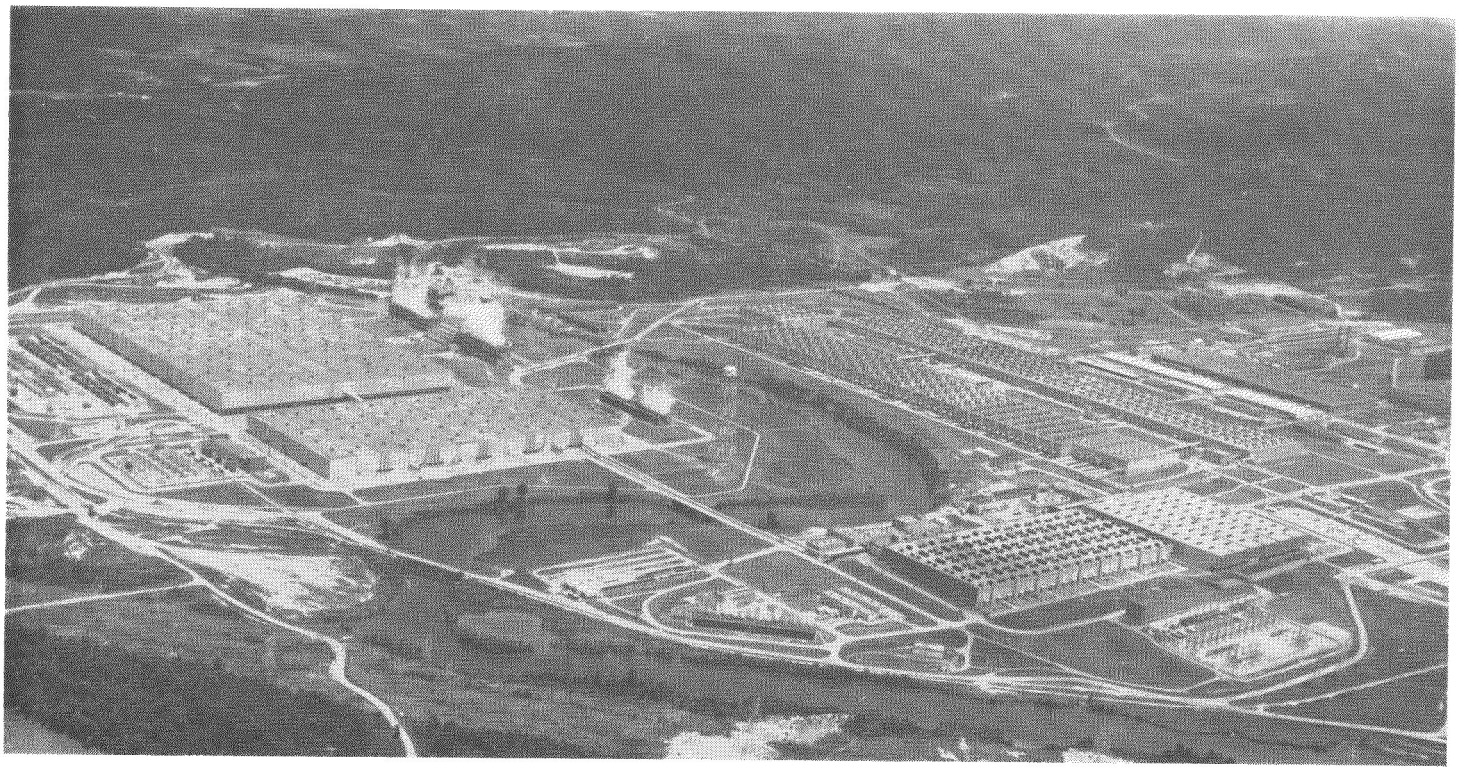

FIGURE 1.—A recent aerial photograph of the gaseous diffusion plant area. Note the cooling towers and the steam rising from them. For comparison purposes, the water tower in the center of the picture is 367 feet high. The view is toward the northeast, which was the direction of the snowfall from the towers.

FIGURE 2.—A view of the cloud formed from water vapor emitted from the cooling tower units during the period discussed here.

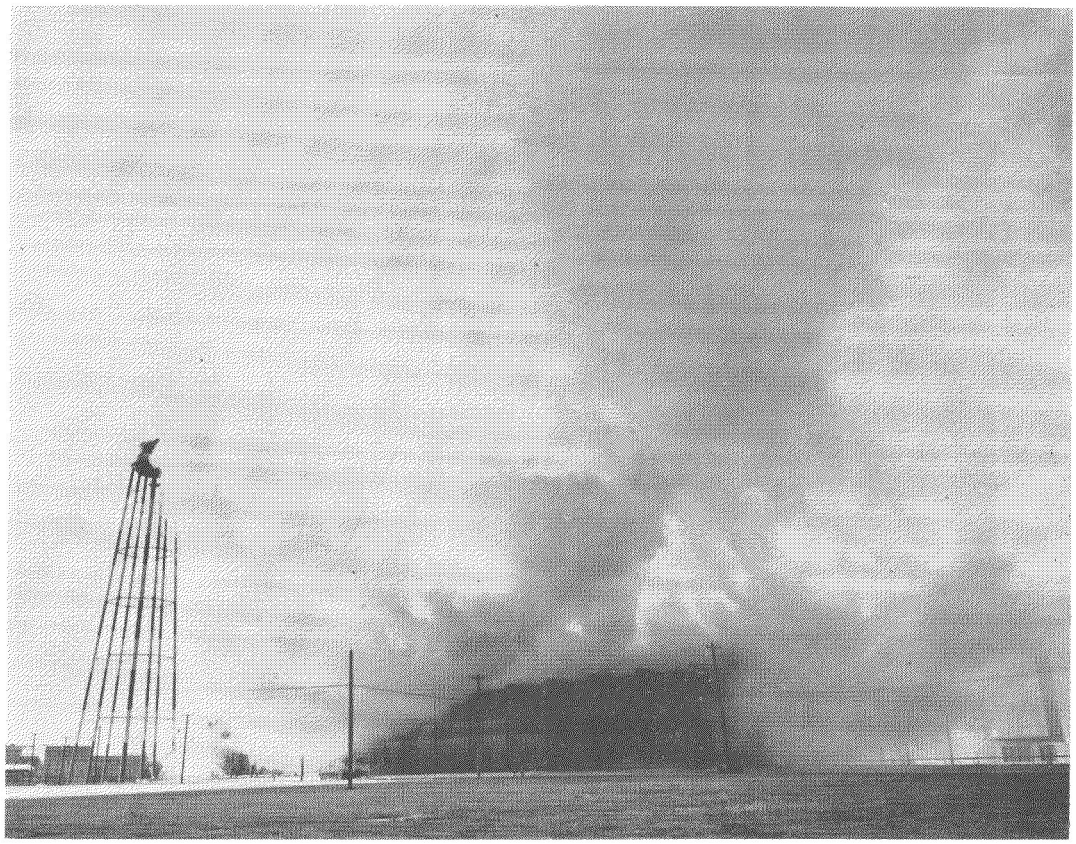

FIGURE 3.—Another view of the cloud formed from water vapor emitted from cooling tower units.

FIGURE 4.—A view of a portion of the snow-covered road in the affected area.

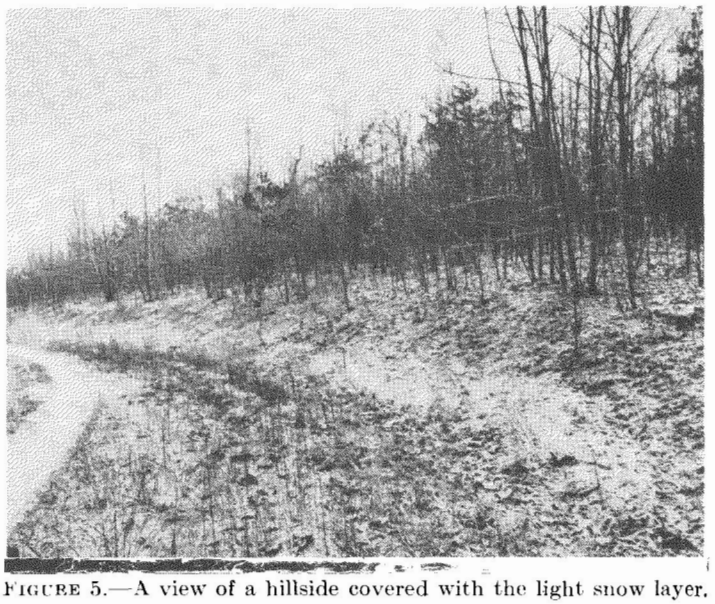

FIGURE 5.—A view of a hillside covered with the light snow layer.

line in nature. Since there were no roads perpendicular to the direction of travel of the cloud, estimates of the lateral distance of snow deposit were not possible. The valley contour, however, suggests a possible width of approximately one mile.

Figure 4 shows a portion of the snow-covered road in the affected area, and figure 5 shows a hillside covered with the light snow layer. No snow existed anywhere in Oak Ridge prior to the incident described above.

The snow had been falling during the night, or at least prior to sunrise (residents of the area reported snow on the ground when they awoke). Between 0800 and 0900 EST there were no clouds outside the affected area. In the area, the clouds ranged from scattered cumulus at 1,000 to 1,500 feet to low stratus (base less than 300 feet) as it snowed. Moisture from the cooling towers rose to an initial height of about 1,500 feet, then, as it progressed downwind, the resulting cloud descended, intermittently reducing visibility on the ground to less than 500 feet.

The temperature at 0500 EST was 7° F., dew point 3° F. At 1200 EST the temperature was 17° F., the dew point 11° F. The wind was southwesterly 6 to 8 m.p.h. during the observed snowfall. We were fortunate to have a freezing nuclei detector operating at the time of the snowfall which showed no increase of detectable nuclei. There are two possible sources of industrial effluents which might be considered as potential nuclei. One is the Tennessee Valley Authority's Kingston steam plant, the largest steam plant in the world, which is located 7 miles southwest of the gaseous diffusion plant. The second, and perhaps more promising source of freezing nuclei, is a ferro-manganese plant at Rockwood, Tenn., 18 miles southwest of the gaseous diffusion plant. Heavy dust emissions from this plant are often visible for several miles.

Although the indications are that the cumulative amount of snowfall definitely attributable to the effluent of the gaseous diffusion plant was trivial, this instance appears to be of at least curiosity value. It provides evidence on the magnitude of what might be termed "artificial cloud generation processes" and critical meteorological environments required for unique "man-made" precipitation.

Acknowledgment.—The photographs were provided through the courtesy and cooperation of the Photographic Services Section, Oak Ridge Operations, U.S. Atomic Energy Commission.